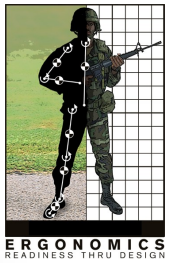
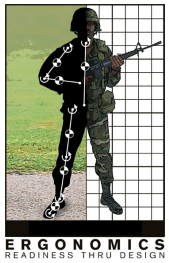
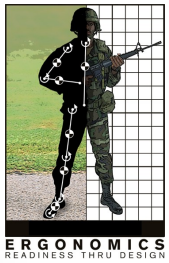


Manual Materials Handling



Manual Materials Handling

- Identify WMSD risks in MMH
- Identify engineering and administrative controls useful in reducing/eliminating MMH WMSD risks
- Review Ergonomic Risk Assessment Codes
- Understand the “usefulness” of back belts
- Review elements of an Ergonomics Program
- View “A Healthy Back” video



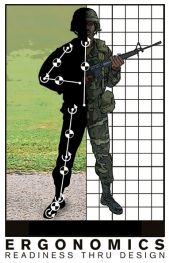
Manual Materials Handling

Military Guidelines

DODI 6055-1, DoD Safety and Occupational Health Program “lifting is a workplace risk factor”

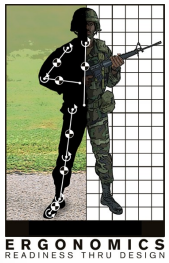
Military Standard 1472F, Department of Defense Design Criteria Standard

Military handbook 759C, Handbook for Human Engineering Guidelines



Manual Materials Handling Back Injuries

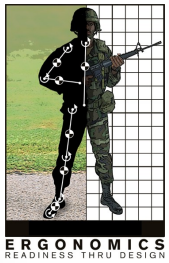
- 27% of all injuries occur due to Manual Material Handling
- Majority of the injuries are back injuries
- Back injuries are the leading cause of disability in the US among people under age 45
- Most expensive healthcare problem for patients 30-50



Manual Materials Handling

Keep in mind the WMSD Risk Factors

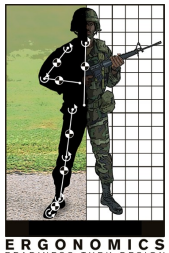
- **Position/Posture**
- **Repetition**
- **Force**
- **Compression/Contact Stress**
- **Vibration**
- **Temperature**
- **Duration**



Manual Materials Handling

WMSD Risk Factors can lead to:

- **Carpal tunnel syndrome**
- **Back injuries**
- **Tendonitis/tenosynovitis**
- **Rotator cuff injury**
- **Epicondylitis**



Manual Material Handling takes many forms

Manual Material Handling

Lifting

Manual Material Handling

Lowering

ERGONOMICS
READINESS THRU DESIGN
USACHPPM
Readiness thru Health
CONSERVARE SALUTEM

Manual Material Handling

Carrying

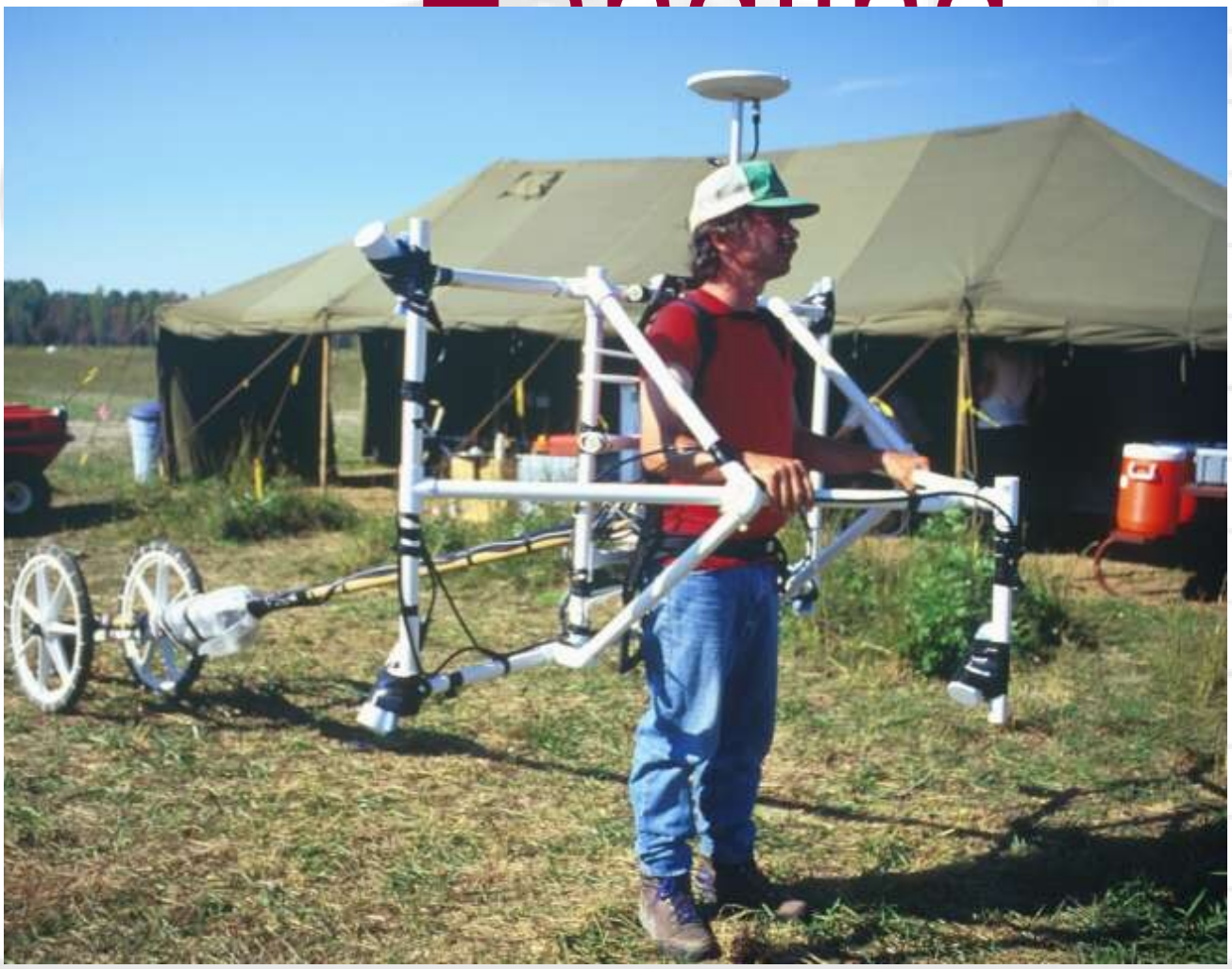
Manual Material Handling

Pulling

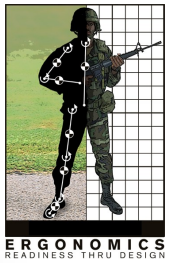
Manual Material Handling

Pushing

Manual Material Handling



Combination



Manual Material Handling

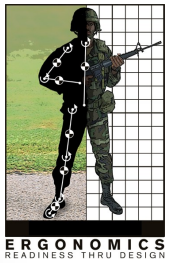
Back Injuries

Are Back Injuries caused:

By a single traumatic event?

or

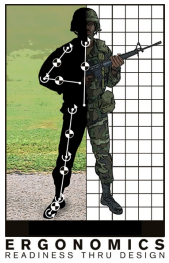
Do they occur over time?



Manual Material Handling

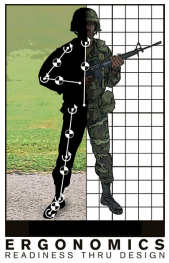
Back Injuries

- Most back injuries result from cumulative stress
- Can finally show up as an injury during a single lift
- Back injuries are considered to be WMSD's



Manual Material Handling Back Injuries

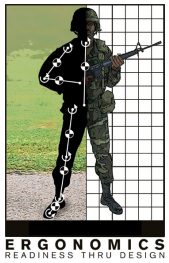
- Workers with previous back injury are more susceptible to re-injury
- Workstation and lifestyle interventions are essential



Manual Material Handling

Back Injuries

- Prevention is the only way to solve back injury problems.
- Best prevention is good engineering controls.

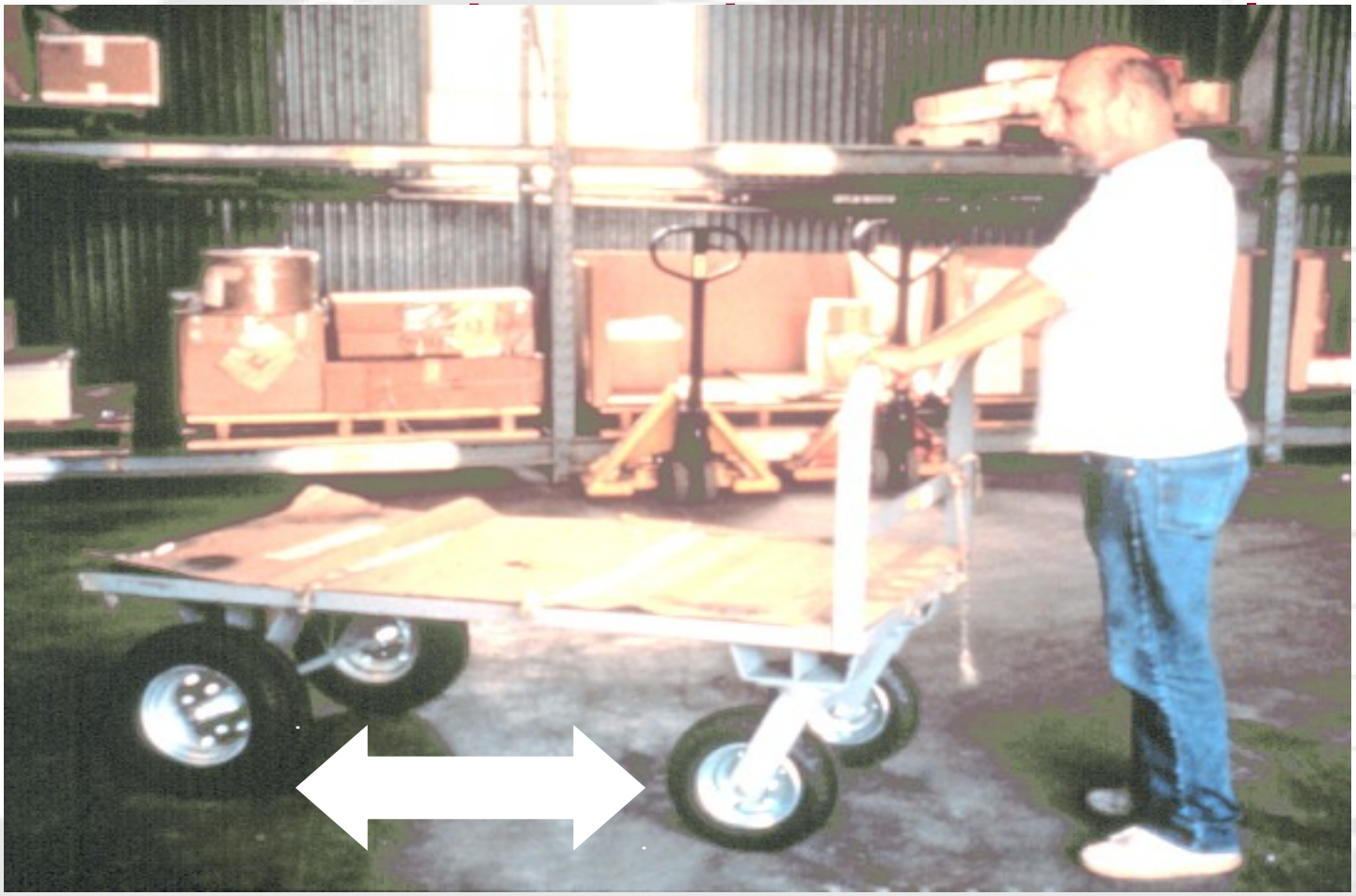


Manual Material Handling Back Injuries

Engineering Controls

- Equipment that eliminates the human from the lift
  - Lifts, carts, tables, etc.

Manual Material Handling



Manual Materials Handling

Engineering Controls

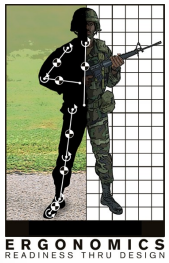
ERGONOMICS
READINESS THRU DESIGN

Manual Materials Handling

Engineering Controls

USACHPPM
Readiness thru Health

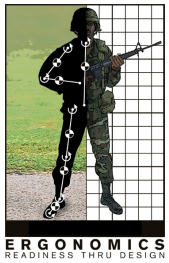
Manual Material Handling



Manual Material Handling

Lifting

How much weight should a worker lift?



Manual Material Handling

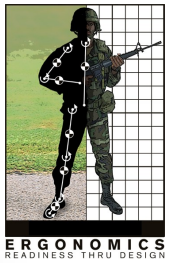
Lifting

NIOSH

Recommended lifting limit is:

51 lbs.

Under optimal conditions



Manual Material Handling

Lifting

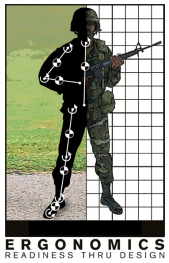
MIL STD 1472 F

Recommended lifting limit for men:

56lbs/lifts up to 5 feet above ground

87 lbs/lifts up to 3 feet above ground

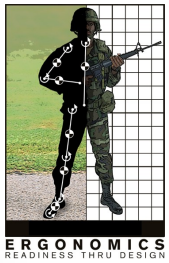
Mixed gender is 37 and 44 lbs



Manual Material Handling

Object Lifting Factors

- Weight of the object
- Size of the object
- Grasp
- Center of gravity
- Object position



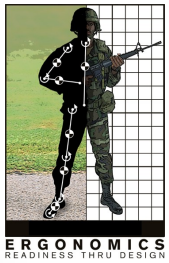
Manual Material Handling

Object Lifting Factors

Weight:

- The heavier the object lifted the greater the force requirement on the body

- Posture and lifting technique can help reduce the forces placed on the body



Manual Material Handling

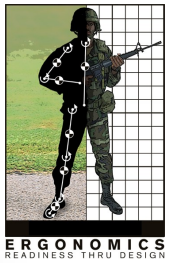
Object Lifting Factors
Size

Objects wider than 30 inches:

- Have a forward center of gravity
- Causes shoulder fatigue
- Resulting in poor lifting technique

Manual Material Handling

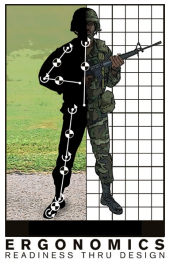
Object Lifting Factors



Manual Material Handling

Object Lifting Factors
Grasp

- Power - for heavy object, Diameter ≤ 2 inches
- Oblique - for tool use, thumb extended, 65% power of power grip

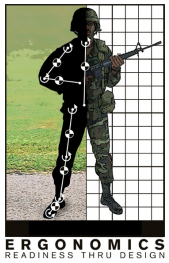


Manual Material Handling

Object Lifting Factors

Grasp

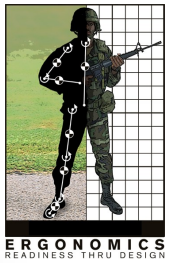
- Palm up:
  - Used for low lifting
    - Not to be used for lifts over elbow height
- Palm down:
  - If repetitive, use objects 1 lb or lighter



Manual Material Handling

Object Lifting Factors
Position

- Start height
- End height
- Distance from the body



Manual Material Handling

Object Lifting Factors

Position

Start and End Height:

- Low lifts (floor to mid-thigh):
- Increases whole body fatigue and low back stress

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PROPERTY OF U.S. POSTAL SERVICE
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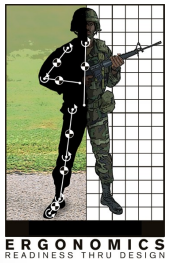

Manual Material Handling

Object Lifting Factors
Position

Distance from the spine

- Forces worker to lean forward
- Increases force on lower back

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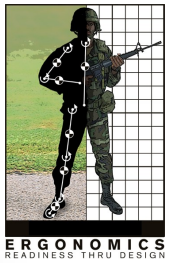

Manual Material Handling

Object Lifting Factors

Position - Start and End Height

- High lifts (above chest):
  - Most difficult for workers
  - Arm muscle fatigue
  - Object balance difficult

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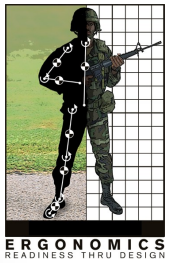
ERGONOMICS
READINESS THRU DESIGN



Manual Material Handling

Object Lifting Factors

- Optimum Start and End Height:
  - Between mid-thigh & chest level
  - Similar to baseball strike zone

READINESS THRU DESIGN

Manual Material Handling

Strike Zone Low Cost Example

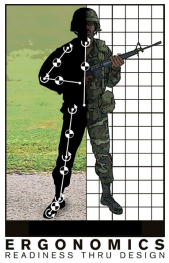
READINESS THRU DESIGN

Manual Material Handling

Strike Zone Medium Cost Example

Manual Material Handling

Strike Zone High Cost Example

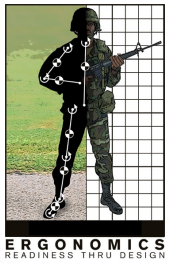


Manual Material Handling

Object Lifting Factors
Position

Rules of Thumb

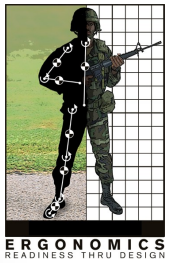
- Work within forearm length
- Upper arms down at the side



Manual Material Handling

Task Requirements
Repetitive Motions

- Usually seen in loading & unloading tasks
- Low lifts lead to general fatigue
- High lifts lead to muscle fatigue



Manual Material Handling

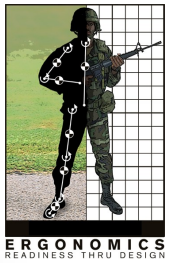
Task Requirements

These are Highly Repetitive Tasks:

Light weights (less than 15 lbs): 5/min

Moderate weights (15 – 30 lbs): 1/ min

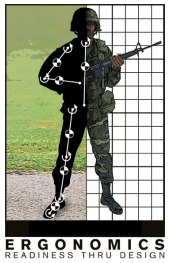
Heavy weights (more than 40 lbs): 1/5 min



Manual Material Handling Task Requirements

High Repetitions Cause: Worker fatigue

- Poor lifting technique

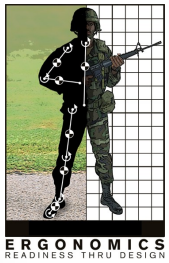


Manual Material Handling

Task Requirements

High Repetitions Due To:

- Machine-paced work
- Piece-based incentives
- Overtime incentives

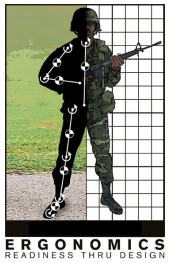


Manual Material Handling

Task Requirements

High Repetition Solutions:

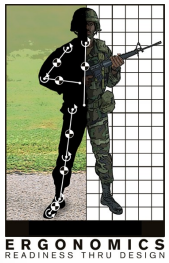
- Worker paced tasks
- Schedule breaks before fatigue



Manual Material Handling

Task Requirements
Static Forces

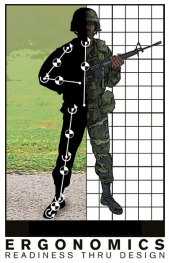
- Common in seated operations
- Static forces are often ignored
- Static work tires muscles faster than dynamic work



Manual Material Handling

Task Requirements
Static Force Solutions

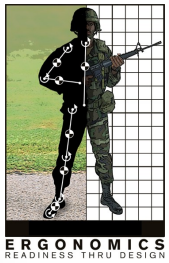
- Neutral posture
- Mechanical support, tool positioners
- Stretching and micro-breaks



Manual Material Handling

Task Requirements
Twisting

- Stresses discs in the back
- Stresses smaller muscles
- Seen more with repetitive lifts



Manual Material Handling

Task Requirements Twisting Solutions

- Workstation arrangement and design can eliminate the twisting
- Add a pivot step

Manual Material Handling

Twisting Solutions

Courtesy of
Kinetic Technologies, LLC

902 Rockefeller Road, Willoughby Hills, OH 44092

Manual Material Handling

Environment

- Obstacles prevent worker from using proper lifting techniques
  - Plan the lift
  - Avoid deep containers

ERGONOMICS
READINESS THRU DESIGN

USACHPPM
Readiness thru Health

MMH

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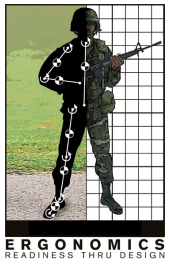


Manual Material Handling Personal Risk Factors

- Age
- Gender
- Physical conditioning

Manual Material Handling

Solutions

The Big Three

Workplace

Job

Container / “Things”

Manual Material Handling Hierarchy

LIFT

LOWER

CARRY

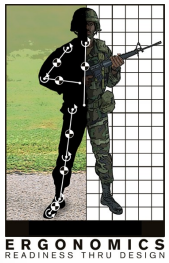
PULL

PUSH

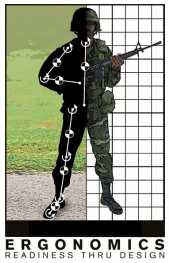
HARDER

EASIER

ERGONOMICS
READINESS THRU DESIGN



QUESTIONS?



Risk Assessment Codes (RACs)

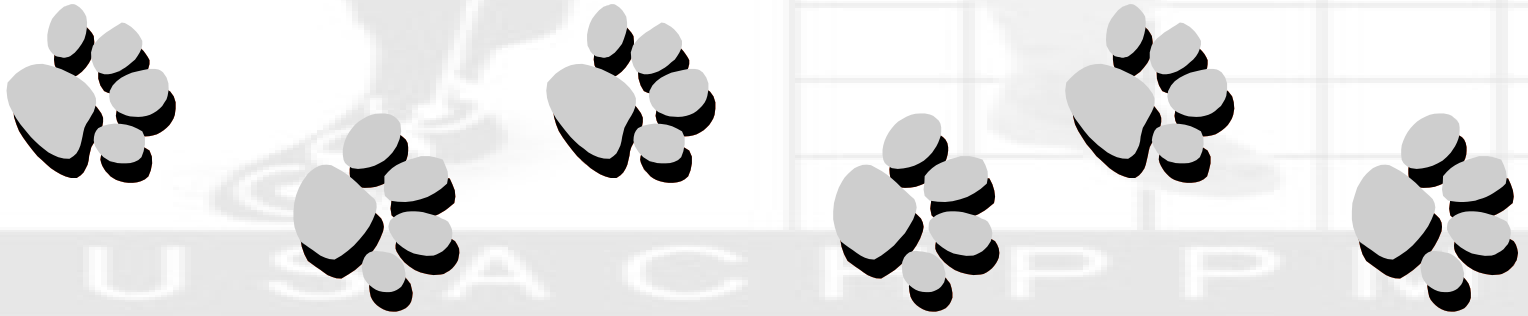
Background

- Describes level of risk
- Prioritizes abatement projects
- Combines
  - Hazard severity
  - Probability

Three step process to determine RAC

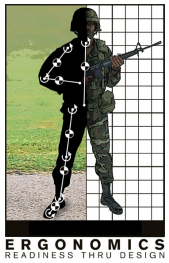
ERGONOMICS
READINESS THRU DESIGN

First Step



USACHPPM
Readiness thru Health

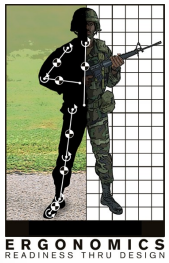
MMH



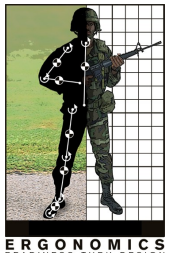
Hazard Severity

Assesses the expected consequence derived by degree of WMSD or occupational illness that could occur from hazard…

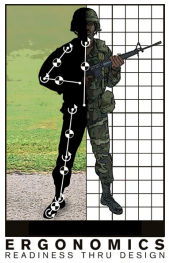
What kind of injury will occur if there is not an ergonomic intervention?



Cat.	Outcome of Severity Category
I	**Permanent total disability**
II	**- Permanent partial disability** **- Temporary total disability of ≥ 60 workdays** **-Temporary partial disability of ≥ 90 workdays**
III	**- Temporary total disability of < 60 days** **- Temporary partial disability of < 90 days** **- Claim for compensation filed**
IV	**- Only first-aid or other minor supportive treatment** **- No claim for compensation filed**



Second Step



Probability of occurrence

The four WMSD probability levels are:

A — Likely to occur immediately

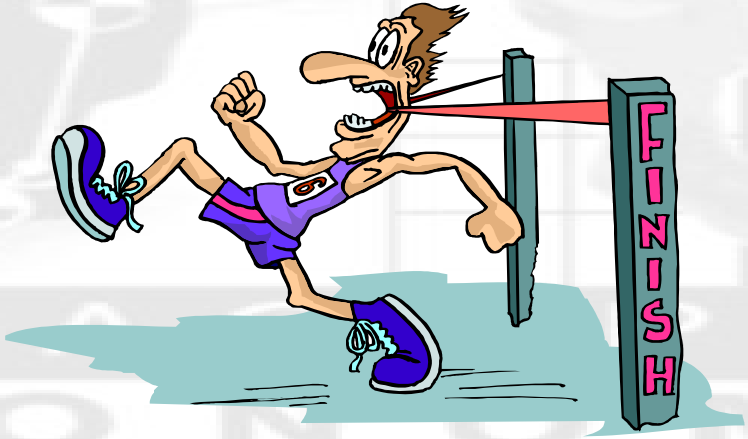
B — Probably will occur in time

C — Possible to occur in time

D — Unlikely to occur

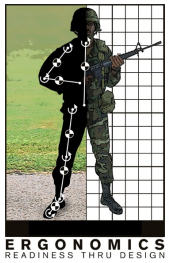
ERGONOMICS
READINESS THRU DESIGN

Third Step



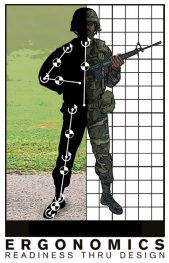
USACHPPM
Readiness thru Health

MMH



Risk Assessment Code Matrix

Risk Assessment Code Matrix				
Hazard	**WMSD Probability**			
Severity	A	B	C	D
I	1	1	2	4
II	1	2	3	4
III	2	3	4	5
IV	4	4	5	5



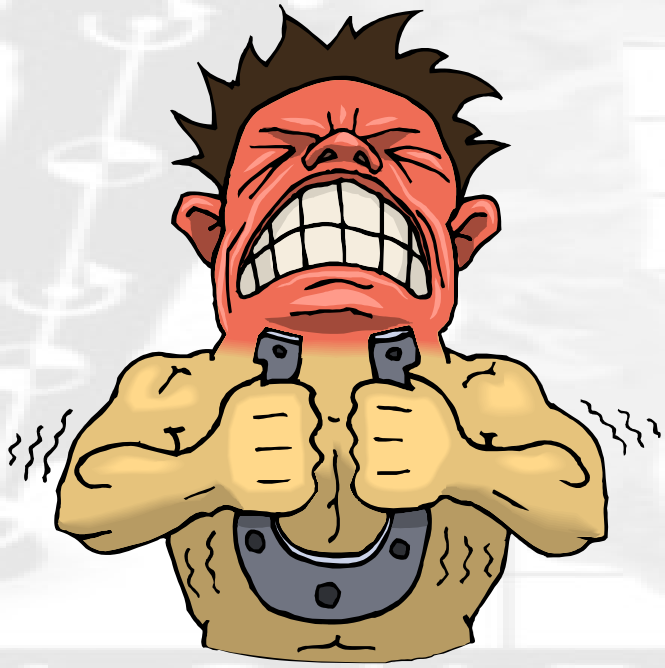
Risk Assessment Codes

- A hazard of one (1) is the worst case

- A RAC of one (1) or two (2) must have an abatement plan prepared within 30 days of the RAC assignment per DOD 6055.1

ERGONOMICS
READINESS THRU DESIGN

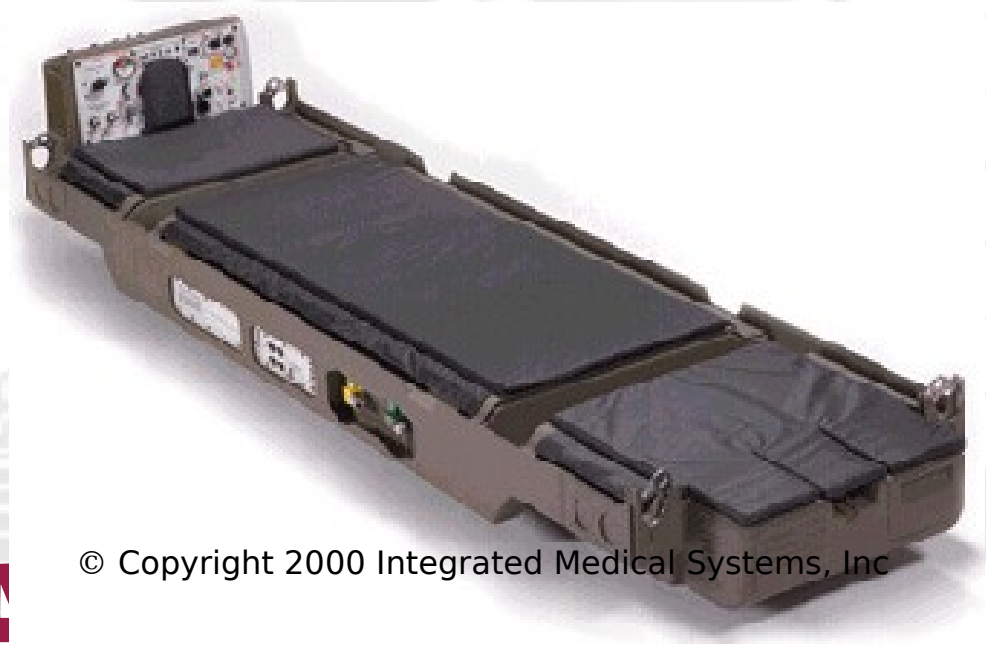
Let’s Try one!



ERGONOMICS
READINESS THRU DESIGN

LSTAT

Life Support for Trauma and Transportation



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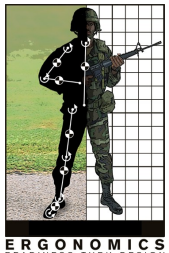
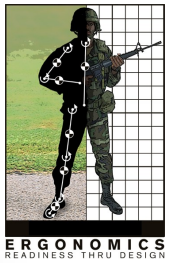
USACHPPM
Readiness thru Health

MMH



LSTAT

for matic...

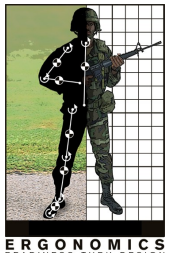


LSAT DETAILS

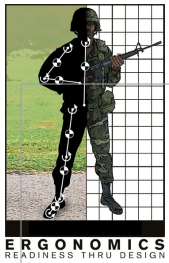
	Best Case Scenario	Worst Case Scenario
Patient	5th percentile female	95th percentile male
Patient Weight	102 lbs	214 lbs
Total Weight	277 lbs total (69.25/soldier)	389 lbs total (97.25/soldier)
Soldier Team	Four male soldiers	Mixed Gender (2 male/2 Female)
Distance Carried	30 feet	150 feet
Lift height to Vehicle	Helicopter (40 inches)	Ambulance (50 inches)

Weight of LSAT = 175 lbs.

4 soldier team

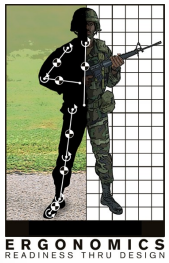


Mil Std 1472F



Mil Std 1472F – DOD Design Criteria Standard, Human Engineering

HANDLING FUNCTION	POPULATION	
	Male and Female	Male Only
A. Lift an object from the floor and place it on a surface not greater than 152 cm (5 ft) above the floor	16.8 kg (37 lb)	25.4 kg (56 lb)
B. Lift an object from the floor and place it on a surface not greater than 91 cm (3 ft) above the floor	20.0 kg (44 lb)	39.5 kg (87 lb)
C. Carry an object 10 m (33 ft) or less	19.0 kg (42 lb)	37.2 kg (82 lb)



Mil Std Caveats

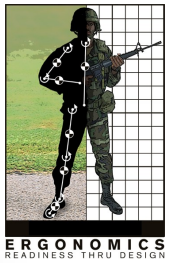
Lifting limits

-Two people – can double the weight

ex. 2 males can lift 112 lbs. together

-Three or more - 75% of one person value

Ex., 3 males can lift (2 x 56) + (.75 x 56) = 154 lbs. together



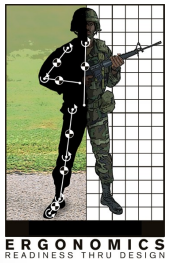
Task Evaluation Result

Risk Assessment Code = 2

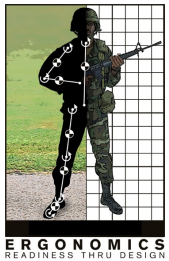
- The hazard severity (HS) index for this task is Category III, possible outcomes:
  - Temporary partial disability of < 90 days
  - Temporary total disability of < 60 days
- The WMSD probability = “A” indicates:
  injury will occur immediately during the task

ERGONOMICS
READINESS THRU DESIGN

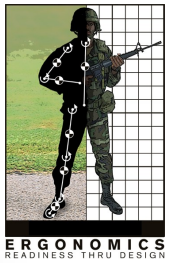
Modification



QUESTIONS?



Back Belts



Manual Material Handling

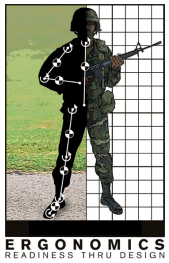
Back Belts

Claim

Increases intra-abdominal pressure

Response:

- Spinal muscle activity
- Cardio-vascular risk

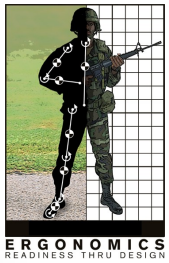


Manual Material Handling

Back Belts

Other Considerations

- Injury rate is highest when discontinue use
- Injury severity is worse when wearing a back belt
- Superman syndrome
- Muscle atrophy

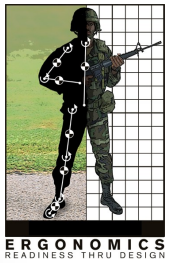


Manual Material Handling

Back Belts

NIOSH Study Dec 2000

- 2 year study
- Largest prospective study ever conducted on back belts
  - Interviewed 9,377 employees
  - 160 newly opened stores



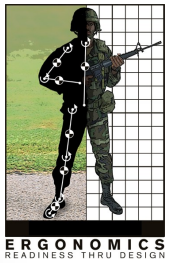
Manual Material Handling

Back Belts

NIOSH Study Result

- No evidence that back belts reduce back injury or back pain for retail workers who lift or move merchandise
- Results of this study are consistent with previous findings

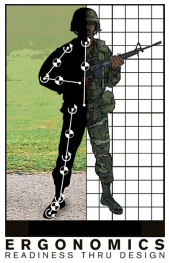
READINESS THRU DESIGN



Manual Material Handling Back Belts

Office of the Surgeon General & DOD:

- Back Belts are Not Recommended
- Research does not endorse use of Back Belts as a preventive measure for back injury

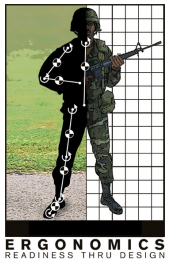


Manual Material Handling

Back Belts
Alternative Solutions

Comprehensive program

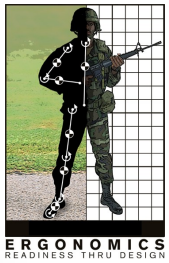
- Lift Analysis
- Risk Management
- Training



Manual Material Handling

Back Belts
Lift Analysis

- NIOSH Lift Equation
- Mil Standard 1472-F
- Snook tables



Manual Material Handling

Back Belts
Risk Management

- Risk Assessment Codes
- Hazard Severity
- Injury Probability

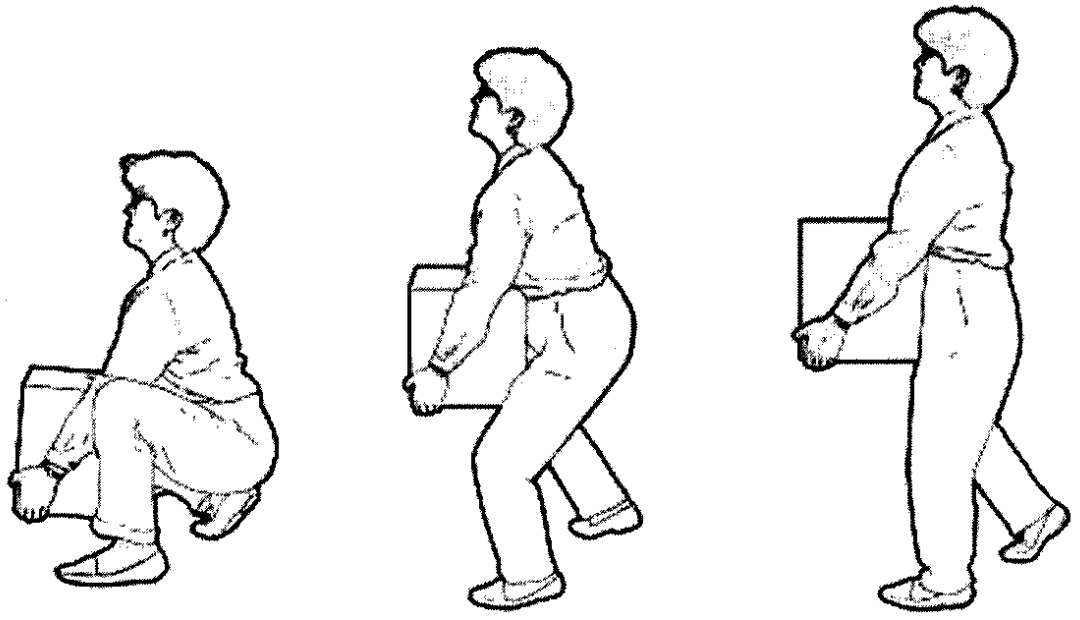
Manual Material Handling

Back Belts Training

- Back Classes
- Lift Classes

Manual Material Handling Basic Lift

The most common method of good lifting technique. Use when the object you are lifting is small enough so you can straddle the object.



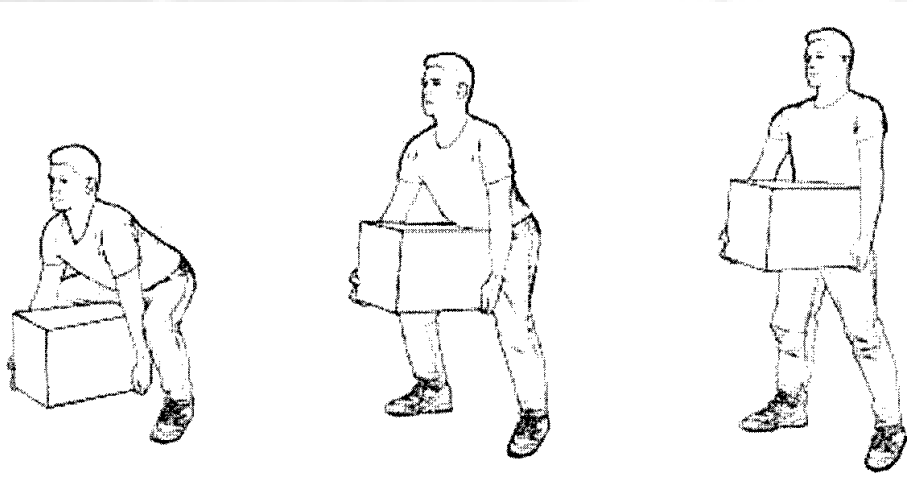
USACHPPM
Readiness thru Health

Manual Material Handling Basic Lift

Similar to basic lift, but for objects too large to straddle.

In this one you have to stick

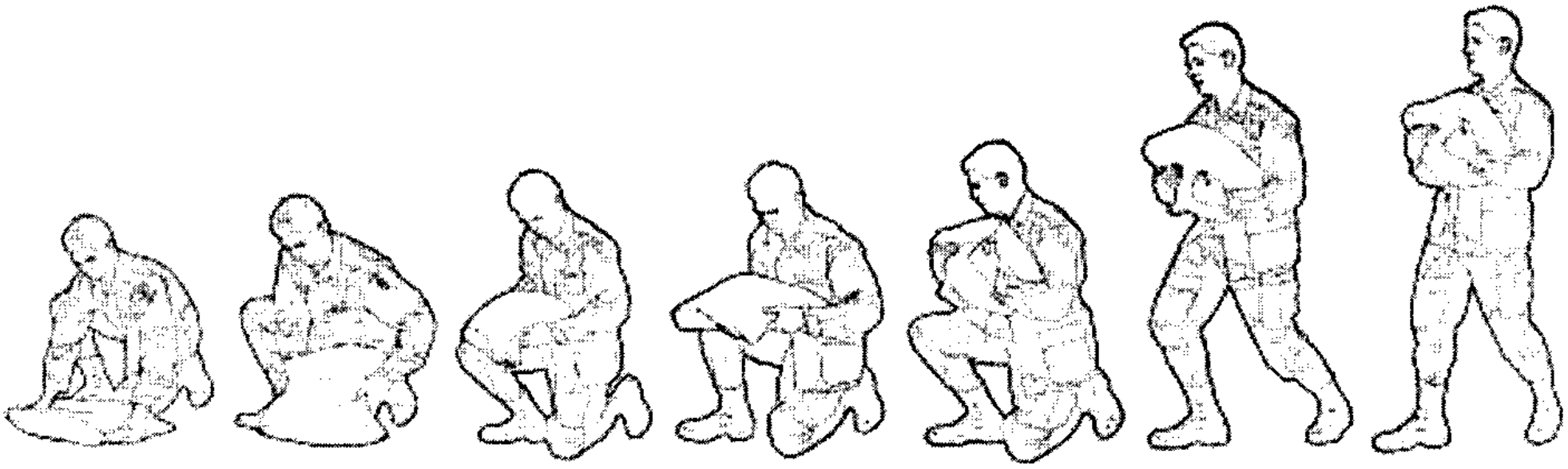
“your bottom out”

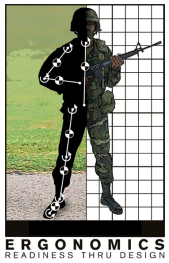


Manual Material Handling

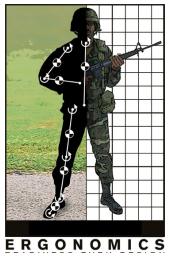
Tripod Lift

This lift is used to lift objects of uneven weight distribution such as sacks of food

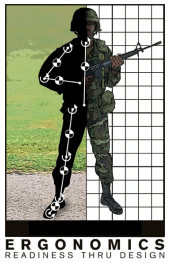




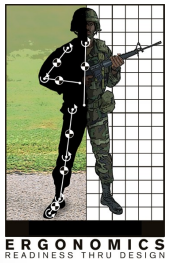
QUESTIONS?



Video Time

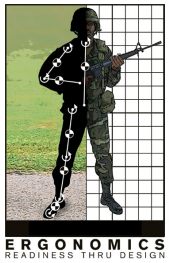


Key Steps for Implementing an Ergonomics Program



DOD/ES Policy Memo 1997

- Deputy Under Secretary of Defense, Environmental Security **memo**
  - **REQUIRED development of ergo programs**
  - **Ergonomics = a health , safety & readiness issue**
- **Decision to publish policy based on injury and illness data for military and civilian workers**
- **Established ergonomic requirements and procedures for the control of WMSDs in DOD**

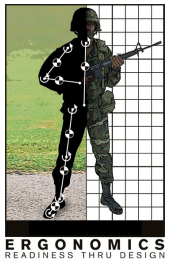


DOD Policy

- Policy requirements published in DODI 6055.1 (1998)

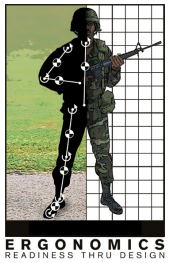
- Website:

  http://www.dtic.mil/whs/directives



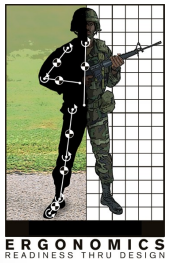
Army Policy

- Ergonomics Program Policy Memo (ASA/ILE ESOH), August, 1998
- Ergonomics Policy Letter (Secretary of Army), July, 2000
- AR 40-5 (Safety)



Ergonomics Program Critical Elements

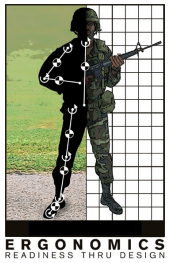
- Written Plan
- Workplace Analysis
- Hazard Prevention and Control
- Health Care Management
- Education and Training
- Program Evaluation and Review
- Material Acquisition



Workplace Analysis

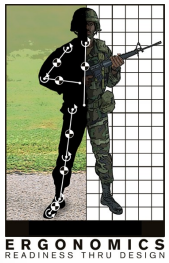
Determine if problem exists and select **high risk** areas by:

- Systematic Passive Surveillance
- Systematic Active Surveillance



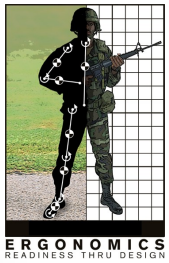
Hazard Prevention and Control

- **Process Elimination**
- **Engineering Controls**
- **Substitution**
- **Work Practices**
- **Administrative Controls**

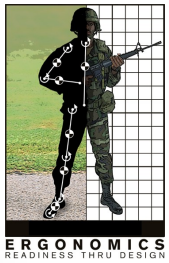


Education & Training

- All personnel potentially exposed to WMSDs
  - Proper use and care of, and procedures for tools and equipment
  - Use of safety equipment
  - Safe and proper work procedure
- *and their* Supervisors, Managers
- Engineers and maintenance personnel
- Installation Safety and Health personnel

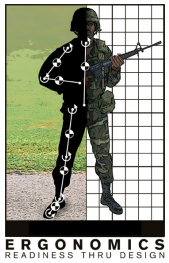


Roles and Responsibilities



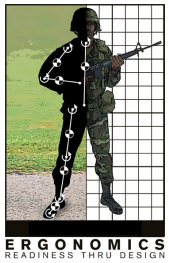
Installation Commander

- Establish Ergonomics Subcommittee
- Integrates Ergonomics
- Approves ergonomics policy
- Supports Ergonomics Program
- Designates an Installation Ergonomics Officer (IEO)



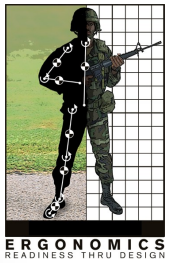
Installation Medical Authority (IMA)

- Helps choose members of Ergonomics Subcommittee
- Ensures written installation protocol



Installation Ergonomics Officer (IEO)

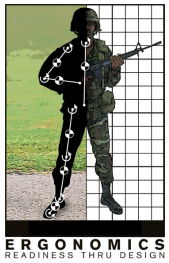
- Qualified health or safety professional
- Has at least 40 hours formal training
- Chairs the Ergonomics Subcommittee
- Develops & Implements installation ergonomics policy
- Ensures accurate record keeping
- Conducts program reviews
- Reports results



References

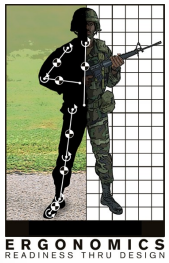
DA-PAM – 40-21

- Provides template for local regulation
- Details the Critical Elements



References

- **Tech Guide 220**
- Provides technical tools to do program requirements outlined in DA-PAM
  - Flowcharts, Checklists, Step by Step Instruction
  - 6 Booklets



USACHPPM Ergonomics Program

Evaluation Services

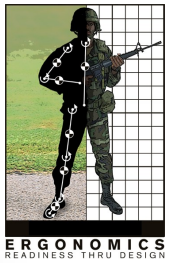
- **Industrial**
- **Office**

Applied Research Services

Training Services

- **40 Hour Courses**
- **1 Hour Courses**
- **Tailored Courses**

Pamphlets, Brochures, Videos, Desktop Consultations, Posters, etc.



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